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Reaching a Diagnosis in Equine Dermatology
- It’s easy if you try... or is it?

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Dermatological disease in equine practice is always a challenge. Veterinarians will be called to see chronic skin cases more than those of acute onset; most owners will either have ignored it (in the hope that it would “go away” or will have applied some medications (usually ill-advised and inappropriate). This not only makes the investigation and diagnosis more difficult but often confuses the treatment also. The good thing about equine dermatology is that many of the conditions can be treated or at least they have a reasonably well defined prognosis. However, relatively little is known about many of the equine skin diseases – extrapolation from other species and ‘misleading, unsupported naming of diseases such as Systemic Lupus Erythematosus and Cushing’s Disease may lead to problems when the treatment is also extrapolated to the horse!. The diseases invariably have major clinical and / or pathological differences from other species and so care should be taken when making the diagnosis; perhaps it is justifiable to emphasise the species specificity and the similarity (rather than the identical nature) of the disease by using the term Equine and “-LIKE” in the names. For example, Equine SLE-like Syndrome implies that the clinical presentation is specific for horses and that a panel of symptoms (hence the term syndrome) shows some similarity to those seen in other species in which the pathology is better established.

A full history must always be taken! This should establish all owner-applied measures as well as an appraisal of the major clinical presentations and the extent of peer / other species involvement in similar states. A logical clinical approach is also essential – many of the conditions can be easily and definitively diagnosed with clinical and historical information alone. Intuitive supposition can be useful but there are significant dangers because many conditions have a common presenting clinical appearance. Only once a diagnosis has been established can treatment be expected to succeed.

Diagnostic aids including specimens of hair, brushings, scrapings and biopsies are frequently taken in equine dermatological investigations; these include skin scrapings, hair plucking and biopsies of various types. In some cases a definitive diagnosis can be established while in others the chronic nature of the condition and / or the complications caused by secondary trauma or infection make them difficult to interpret. Pathologically useful information is usually restricted to early, carefully selected lesions and correct sampling methods.

For the most part equine skin disease can be usefully divided into infectious and non-infectious disease. The former include viruses, bacteria, fungi, protozoa and internal and external parasitic conditions. The latter include traumatic and allergic / immunological skin disease as well as developmental / genetic conditions, endocrinologic changes, and neoplastic disease. A few equine skin conditions can be due to nutritional and neurologic problems and others are secondary to vascular disease or iatrogenic damage to the skin.

The six major categories of equine skin disease are:
1. Moist / exudative(crusting) dermatoses
2. Dry (scaling and flaking) dermatoses
3. Nodular skin disease (neoplastic and non-neoplastic nodules)
4. Pruritus
5. Hair coat density alterations (Alopecia & hair loss / hirsutism)
6. Pigmentary changes
Treatment of equine skin disease has been significantly, and often adversely, affected by the gradual erosion of the available therapeutic measures that can be taken. Nevertheless, the equine skin is tolerant of damage and will usually recover reasonably well if the inciting cause is removed. In some cases this is easier to say than do – secondary changes and iatrogenic interference confuse the treatment markedly and in some conditions the cause cannot be treated. Secondary skin disease, such as hepatic-derivation photosensitisation (HDP) simply points the clinician in the direction of the (usually) more important underlying disease. Secondary changes resulting from iatrogenic or self traumatic interference, may force the clinician to address the secondary effects first and then to restart the diagnostic process when the clinical syndrome is clearer.
Introduction:

The skin of the horse is its biggest organ and is by far the most easily examined – it is directly visible, palpable and is easily examined over the entire body. There are significant areas on the horse skin that tend to be forgotten such as the foot – the hoof is simply a modified skin structure! In practice equine skin disease is a common challenge. However, it is unfortunate that owners will almost always have “had a go” at treatment – often using inappropriate medications and concoctions that really have little or no chance of successfully treating the problem. This simply services to confuse the diagnosis – a strong chemical applied to the skin can cause serious deterioration and masking of primary signs so making the clinical investigation much more difficult. The added complication of failure to declare the previous “treatments” is another problem.

Figure 1a/b: The normal skin of a horse varies from the highly lustrous short summer coat (left) to the longer, denser winter coat. Abnormal coat and obvious lesions are usually very apparent. It’s not really the detection of the lesions / abnormalities that is difficult – it’s making a diagnosis that is the challenge. In some cases the signs are pathognomonic or at least suggestive of the diagnosis. In the picture on the right an old horse with the hirsutism typical of Pituitary Pars Intermedia Dysfunction (Equine Cushing’s Disease) is shown. This is in effect the only condition that causes severe acquired hirsutism.

The skin is also an effective window on the health or otherwise of many other organs and systems. The skin can be seriously affected by internal disease and so it is critical to the investigation to consider all the available possibilities rather than just the skin itself. For example, an acute onset of an apparent photosensitisation affecting the blaze and muzzle could be associated with advanced liver disease, or ingestion of a photoactive plant such as St Johns Wort (Hypericum perforatum) or could indeed simply be a matter of sun exposure (actinic burn). In the former case management of the skin alone would be pointless while in the latter simply reduction in exposure to sunlight by application of sunblock or stabling the horse would be curative. If the problem was being caused by ingestion of a photoactive plant then of course the grazing and management must be investigated. This case simply illustrates the importance of an encompassing /holistic approach to the investigation – there should be no assumptions and certainly no speedy conclusions – Diagnose in haste, repent / regret at leisure! In spite of this intuitive supposition is a common approach to skin diseases but serious errors can be made.
because of the general clinical similarity of many of the skin conditions.

**Investigating the skin problem:**
The investigation of the dermatology case therefore includes:

1. The signalment of the horse. This matters in all diagnostic medicine spheres because there are some conditions that are restricted to the specific breed, sex, age, and even colour! For example a nodule in the perineal skin of a grey horse has a very high likelihood of being a melanoma! An old horse presented with hirsutism is likely to have Equine Cushing’s Disease and this condition is virtually impossible in horses under 12 – 15 years of age. Appaloosa horses suffer from a characteristic mane and Tail Dystrophy as well as progressive pigmentary changes as they age (See Figure 2). When submitting any diagnostic specimen or information it is essential that these data are included in every case. It is unfair to simply submit a specimen taken from “a horse”!

2. The full long term history of the horse (to establish the previous disease / illness history and the management / use). Some skin diseases occur seasonally and many become progressively worse. Some skin disease arise as a result of drug eruptions or allergic responses to inhaled environmental allergens kin diseases. For example a horse that is on long term steroid therapy for an airway disease problem could easily develop skin infections a result of immunocompromise. The concept of contagion is also an important issue in dermatology, given that the horse has several important ectoparasites. Pruritus is a common frustrating clinical sign – there are quite different diagnostic implications for a single pruritic horse in a group from those where several or all are pruritic. In the former case an individual disorder is likely while in the latter some contagious cause of pruritus such as lice or Chorioptes sp. mites could be involved.

3. A detailed history of the “owners’ complaint” in which the symptoms are explored historically in detail. For example in a case presented for pruritus, it is important to ask if pruritus was the first presenting symptom; it may be the most obvious but there may have been a pre-existing clinical condition that owner failed to recognise as significant. On some occasions careful questioning will establish that the owner may have developed skin lesions but it is also possible that this is unrelated – the interpretation of the presenting signs is a skill that is acquired with experience. Quite often the summary statement made by the owner is a major factor in the investigation but it can also be misleading. For example the owner could complain a localised skin eruption but fail to note that there are concurrent symptoms of weight loss. The converse is also possible and so the role of the history is paramount in the investigation and must therefore be taken with care and some understanding that the client may be unwilling to divulges some information for fear of criticism!
4. A full physical clinical examination is always justified even when the skin signs are limited in severity and extent and even when they seem trivial. This need not be exhaustive but the full range of body systems should always be considered because there are skin diseases that occur secondarily to other sometimes more serious diseases and there are also skin diseases that have secondary systemic implications. It is remarkable how often this is not carried out and then how easy it is to miss significant features such as icterus, haemorrhages or polydipsia / polyuria! Some reference to lameness problems could have a significant diagnostic implication in some skin diseases and similarly neurological signs or weight loss detected in a horse with putative photosensitisation could be very significant.

5. The focussed dermatological examination in which a detailed description is made of the types, location(s) and extent of the various recognisable morphological lesions. It is important to recognise the various options in lesion description and to make a proper diagrammatic map of the distribution and numbers of the detectable signs. This may seem very tedious for a busy practitioner but it can literally be a reputation saver. In the event that treatment is successful a record can be kept and evidence based publications can be made. In the event of failure or the need to follow / assess progression in the face of client scepticism or criticism, the true picture can be followed. This serves several purposes including providing an accurate starting point from which changes in distribution and extent, progression or improvement and responses to treatment can be assessed objectively. Photographic records are professionally satisfying and a very effective way of assessing the progress of a case.

Having completed the clinical examination the clinician should construct a problem list that includes all the detected skin and other signs. Some may be irrelevant but some could be important. In some cases several individual problems can be tied together to add to the diagnostic value. From this list therefore it should be possible to formulate a differential diagnostic list in order of likelihood – nothing should be excluded but of course some possibilities can be set aside early for epidemiological, geographical and historical reasons. For example a linking series of ulcerated nodules in a horse in UK would not (normally at least!) be due to epizootic lymphangitis! Sarcoids or ulcerative lymphangitis due to corynebacterial infection would be far more likely. The conditions that are encountered in Southern Africa may be very different from those in America. Therefore text book descriptions are to be treated with some caution.
Many clinicians have a tendency to use intuitive supposition as the mainstay of their diagnosis and whilst this often works well for experienced clinicians it is still an unwise method because many different conditions present with a common relatively few clinical signs! Pruritus could be parasitic, allergic or atopic in origin! A nodular lesion on the inguinal region of an old grey horse may well be a melanoma but it could also be a sarcoïd, lymphoma or even a collagenolytic granuloma. The outlook and treatment options for the various possibilities are very different and so a mistake might at best have no benefit but at worst it could convert a treatable case into a disaster.

A structured approach to the differential diagnosis is helpful so that no possibility is ignored! In the first instance I use a division between non-infectious conditions and infectious disease (i.e. caused by an infectious agent).

Figure 5: This mare was presented with severe perineal pruritus that had resulted in marked hair damage (not alopecia!). It was assumed to be Insect Bite hypersensitivity but failed to respond to all the normal “treatments”. It was in fact the result of a severe *Oxyuris equi* infestation.

Non-infectious skin diseases are very common in horses.

1. **Genetic or developmental** skin disorders are seldom recognised because each of the recognised disorders is rare. Cutaneous agenesis or *epidermolysis bullosa* are very rare – the latter has a genetic origin and is more often encountered in the Belgian breed. The large majority of congenital or developmental conditions are manifest early in life – possibly within the first few days but some are much later. Hereditary Equine Regional Dermal Aesthenia (Cutaneous asthenia / Ehlers Danloss Syndrome / Fragile skin Disease) may only be detected when the horse is harnessed in some way or is injured. In this condition the skin lacks adequate strength in its connection to the subcutaneous tissues and so traumatic injury or excessive movement results in vascular disruption and necrosis of the overlying skin. The wound fails to heal or heal very slowly. Scarring is extensive and no sooner has one area healed another becomes affected. Dermoid cysts are commonly recognised in adult horses although they are a congenital deformity of the hair follicles and glands in a localised area – characteristically they develop along the dorsal midline. Probably the commonest congenital skin condition is the nasal atheroma – a dermal inclusion cyst that is usually only of incidental cosmetic significance.
2. **Allergic and Immunological** diseases of the skin are important in horses. The commonest ‘allergic disease’ in horses is surely urticaria but in spite of the high prevalence in the horse there is still considerable controversy over its aetiopathogenesis. For example some specialists believe that it is due to vaso-active amines in the diet and that simply reducing the feeds responsible the condition will resolve. Others believe that there is a genuine underlying hypersensitivity to inhaled, ingested or contacted allergens.

Figure 6: This 4 year-old TB colt in training suffered from severe urticaria every time he ate cereal based feeds. Treatment with drugs was not possible and dietary avoidance strategies were successful in allowing the colt to race (and win!).

The diagnosis of the allergic and immune mediated diseases (whether autogenous or not) is often problematic for reasons of poor pathological and clinical descriptions in the literature and possibly unjustifiable extrapolation from other species so that the terms Lupus Erythematous for example are used. The signs may be somewhat similar but in this example, no Lupus cells have been identified in the horse. The name Equine SLE-like Syndrome is therefore possibly better justified. The range of immune diseases does however, include all the recognised hypersensitivity options including atopy (a congenital IgE related hypersensitivity to environmental allergens either ingested or inhaled (seldom contact!). Insect hypersensitivity (mainly to Culicoides spp. midges) is probably by far the commonest cause of seasonal pruritus but the seasonality and specific circumstances within that seasonality / management make the diagnosis relatively straightforward. However, recent research has confirmed that in many cases the same signs can be due to similar antigens derived from other insect bites. Furthermore it is sometimes difficult to separate a hypersensitivity response to a few bites from a swarm challenge resulting in a severe clinical response.

Autoimmune conditions of the pemphigus group appear regularly in equine practice. The early signs can easily be missed or misdiagnosed. For example the focal early lesions of *Pemphigus foliaceus* can easily be mistaken for dermatophytosis. Treatment for the latter will not resolve the problem of course and even after many months some cases still have not been diagnosed properly. Whether an early diagnosis improves the prognosis for these cases is another matter but wasted treatments and resources are disappointing. Far better to delay treatment until a diagnosis can be made unless the clinical signs demand immediate intervention.
Immune compromising disease ranging from the congenital immunodeficiency conditions (Fell Pony and SCID Syndromes) to the old-age cortisol-related compromise of Equine Cushing’s Disease, result in rapid development of skin infections – an individual presented with an unlikely infection should be investigated for possible underlying immune compromise. It is also important to remember that some viral infections, deficiency diseases and chronic debility also impair the natural skin defence system and so a whole range of cutaneous clinical signs can develop.

3. **Traumatic** skin injuries are extremely common in practice and the management of wounds is a significant dermatological issue. Failure to understand the structure of skin and its response to injury means that wound management is inevitably compromised.

4. **Chemical and toxicity** problems in skin disease can arise from internal ingestion (either primarily affecting the skin or secondarily as a result of internal organ damage). Whilst major toxicities such as arsenic have largely disappeared there are others such as selenium that have become more prevalent – selenium toxicity results in significant dermatological signs including severe laminitis (it’s a dermatological problem!) and hair loss (including the mane and tail). It is an unfortunate fact that many owners will apply all manner of concoctions to the skin of a horse when they would not dream of applying them to themselves! These include engine oil, battery acid, thermal heat, chemical blisters and so on. Furthermore in many cases owners and sometimes vets also are inclined to panic and use over-strength medications. These can be equally dangerous. An accurate history then is sometimes hard to get – confessions are not a standard approach with most horse owners.

5. **Nutritional** deficiencies are rare in horses but some such as Zinc are important causes of generalised skin disease. Although there are reports of vitamin A deficiency, it is hard to visualise how that circumstance could arise in normal stable circumstances in the UK. Severe nutritional deprivation may lower immune status (this applies especially it seems to selenium deficiencies) and so secondary skin infections may develop. The major part of the sign relates then to the secondary problem but failure to consider the underlying disorder will inevitably delay or prevent resolution.

![Figure 7: This 14 year-old hunter type gelding developed circular crusting lesions over the whole body and histological confirmation of Pemphigus foliaceus was made by biopsy. The condition had been treated as ringworm for some 12 months.](image7)

![Figure 8: This extensive chemical burn was caused by the use of strong iodine solution in an attempt to resolve a persistent dermatophilosis infection.](image8)
Neoplastic diseases are largely limited in the horse to a few common and easily recognized tumour types such as the sarcoid, squamous cell carcinoma, melanoma and lymphoma. Beyond this there is a wide range of rarer skin cancers of various types. In equine dermatology we suffer badly from the lack of significant numbers of cases in the latter group – most literature reports are for single or few cases and so it difficult to devise treatment protocols for these. Nevertheless, neoplastic disease is very important and the normal limitations in treatment are bound to be encountered in the horse, as in other species.

Figure 9: A typical Type 2 (sessile) fibroblastic sarcoid. This condition occurs in 6 well-recognized forms each of which has an extensive range of differential conditions that have to be considered. Biopsy is of course the definitive differentiation method but is not without hazard.

There are even some neurological conditions of the skin – localized sweating and focal alopecia associated with altered blood flow or local pruritus from a trapped cervical nerve. Skin disease related to the abnormal behaviour of the neuroendocrine system such as PPID (Equine Cushing’s Disease) also well recognized.

Figure 10: Localised sweating syndromes are relatively common and are usually associated with autonomic nervous system damage. In this case there was a cervical vertebral fracture at C7.

Iatrogenic skin damage is common. It is an unfortunate fact that many owners will have either caused skin disease through inappropriate use of chemicals on the skin (soap powders, strong antiseptics, over-strength medications etc). Establishing the history in this respect is often highly problematic. It sometimes helps to ask “What is this that has been put on the skin?” rather than “Has anything been applied to the skin?”

In spite of all the diagnostic skills that can be brought to bear there are still some cases that cannot be diagnosed – these can be categorised as “idiopathic”. Usually these are managed conservatively and only broad conclusions can be drawn from the results of treatment and management alterations. There are in fact few such disorders and failure to reach a diagnosis may simply mean that something has been left out of the investigation process. Diagnostic tests may help.

Infections should be considered in each of the following categories:

1. Virus Disease: there are many viral conditions of the skin of the horse and some are potentially very significant epidemiologically. For example coital exanthema is a
venereal transmitted skin disease due to Equine Herpes Virus 3. A mare that is infected after service indicates that the stallion had the infection or is likely to have acquired the infection from the mare and in either case there may be important issues relating to management – even though the disease itself has limited clinical implications in the individual horse. A yearling presented with viral papillomatosis (Grass Warts) may simply be the first of a more widespread outbreak affecting several peers on the same pasture. Close examination of others in the group may show either the early signs or evidence of healed lesions that may not have been noticed. The implications for future years may need to be discussed with the owner of the studs because once the virus is present in the pasture sequential crops of foals may be come infected.

2. **Bacterial Disease**: bacterial diseases of the skin are common. Some are well recognised. The reality is that the natural flora of the skin comprises a wide range of bacterial species (as well as some fungi too!) - this complex relationship is normally protective against pathogens and most bacterial infections require particular types of circumstance to develop. Therefore most are probably best thought of as secondary events but as they are often significant, specific targeted treatment is usually used. The problem is that systemic antibacterial therapy (even when the bacterium is known / confirmed to be sensitive) often fails to reach an MIC in the skin itself. Even large doses administered frequently often appear to have little effect. Topical applications rely on skin penetration and that can be very difficult. Commonly skin antiseptics such as chlorhexidine or Povidone are used as broad spectrum therapy but they too often fail to penetrate effectively into the hair follicles.

Common skin infections include dermatophilosis, staphylococcal folliculitis / farunculosis and streptococcal dermatitis. In most cases there is a dominant species but in some a complex infection is involved. Some very serious conditions can arise when the life of the horse is threatened.

3. **Fungal Diseases** form a common and important aspect of equine dermatology. Dermatophytes are a regular problem in large yards where they occur recurrently year after year, and where cattle and rodent contact is close. Stables that have had previous cases of ringworm will usually get them again. The spores are highly resistant to environmental factors and the diseases tend to be highly contagious. However, the skin needs to be damaged and so lesions tend to be seen first (at least) around areas of skin trauma such as girth, sides, face and other tack contact areas. In some cases fly bites can transmit the infection from site to site and from horse to horse and then the pattern of the bite / lesion can be helpful. Most of the dermatophytes are zoonotic but it seems that equine species of both *Trichophyton* and *Microsporum* are far less liable to human transmission than other species.

Figure 11: *T equinum var equinum* infection resulting from the use of a contaminated girth. Several horses in the yard were similarly affected. It is important to know the species of ringworm involved because this provided information on the origin and therefore the focus of the
control measures to be used.

4. **Protozoal Disease** is a rare cause of skin infection but it should not be entirely forgotten – *Besnoitia* sp. does cause some skin lesions in donkeys in some parts of the world including I believe South Africa!

5. **Parasitic diseases** are a common cause of pruritus and dermal skin lesions.
   a. **Ectoparasites** are important in horses and are potentially contagious between horses by direct and close contacts. Probably up to 80 – 85% of pruritic horses will have a parasitic component (although that does not mean that parasites cause 80% of pruritus in horses of course!) . Finding ectoparasites on horses can be difficult because there is no defined severity of itch for a defined parasite nor for the number of parasites . Some horses will itch severely with a few mites or lice but others will be almost (or completely) symptom free when they are severely affected. The concept of symptom free “carrier” horses is particularly important in *Chorioptes equi* infestations. Control of parasitic infestations (whether internal or external) is important and the efficiency of treatment and prevention will depend on the veterinarian knowing the species involved and then the life cycle of the insect or worm. The life cycle can be used to identify weak-spots where access and control can be more effective than others.

*Chorioptes equi* causes pruritus and mild to severe scaling in many cases but some horses have heavy infestations without any apparent signs. There may be some hypersensitivity component in those horses that are intensely pruritic when only a very few mites are present. Lice of both the scale feeding and blood sucking varieties occur in horses – both cause pruritus and a moth eaten skin appearance but the sucking louse (*Haematopinus asini*) can cause significant anaemia – emphasising the value of a full clinical examination in all dermatological cases.

Some ectoparasites cause signs that are not immediately ascribable to parasitic organisms. *Habronema musca* is becoming more prevalent in UK (although it is still by any token, rare) and it can simply present as a flat ulcerated wound that fails to heal (characteristically on the face below the medial canthus of the eye). The parasite is transmitted by Muscid flies and so is strongly seasonal – hence its name ‘summer sores’. Interestingly there appears to be a strong recurrence rate in individual animals implying some sort of genetic susceptibility and no effective immunity that lasts from year to year. Some animals are resolutely resistant! Seasonality is an important issue in ectoparasitic skin disease (for example trombiculidiasis only occurs in autumn months) – careful questioning may establish this and therefore narrow the diagnostic options significantly. Also there are geographical aspects that should be considered – *Trombicula autumnalis* is restricted to chalky soiled areas and so is an unlikely diagnosis is spring time on clay soils! There are many ‘casual’ / opportunistic ectoparasites that affect horses including the poultry mite (*Dermanyssus gallinae*) and the forage mites. Even low numbers of these blood sucking mites can cause serious skin disease accompanied by moderate – severe pruritus but the circumstances are usually obvious.
Figure 12: Typical cases of Habronemiasis. This is a seasonal condition, the severity of which is usually dependent on an individual’s susceptibility. Many cases are affected year after year and usually the signs are worse each succeeding season. The condition can affect wounds also.

It is easy to ignore internal parasites as a cause of skin disease but over recent years several causes of Onchocercosis (microfilariasis / O. cervicalis) have been diagnosed in the UK. The signs are usually fairly dramatic and the characteristic feature is the development of a florid necrotising focal dermal lesion following use of ivermectin anthelminthic. Oxuysis equi is a cause of tail and peri-anal rubbing – the primary disease is probably incidental but the effects can be considerable and the signs need to be considered in the differential diagnosis of perineal / tail base rubbing / pruritus.

The collection of diagnostic specimens:
Because the skin can only respond in a defined number of ways for a wide range of aetiologies, it is common practice to collect samples for the laboratory support of diagnoses and diagnostic rule-outs. There are a limited number of simple basic tests but their simplicity should not be taken to indicate that they are of limited value. Of course each test should be considered carefully – by judicious selection it should be possible in most cases to establish at least the basic pathology. It is however, unfair to expect pathologists to “make the diagnosis, especially if the full clinical information is not provided. In most cases, pathologists are uncomfortable with providing information on treatment

a) Skin Scraping:
This is primarily designed to identify burrowing skin mites, which are in any case uncommon in horses. The commonest mite in the UK is Chorioptes equi, which is a surface feeding mite and so groomings are usually better. Scrapings can also be useful in dermatophytosis (ringworm) diagnosis but plucking is probably better and easier.

**Method:** Using a 22 scalpel blade selected areas are shaved directly into sterile containers. The areas can be slightly moistened with mineral oil and applied to a slide directly. Either type of sample should be covered with enough mineral oil to allow the placement of a cover-slip and the sample is examined under x10 and x20 objectives.

Demodex spp will only be found if scrapings are deep and taken with gentle squeezing of the skin during the procedure. Demodex is a commensal in the eyelids and muzzle regions of some horses – it is extremely rare to find any at all and pathological states are almost unheard of.

For ringworm examination the sample may be examined directly but it may
be better to digest the keratin with warm 10% KOH before examination. Most ringworm cases in UK are *Trichophyton* spp. And so have endothrix spores. They do not therefore fluoresce under UV light.

**b) Skin Groomings:**
Using a small dustpan or Petri dish and a stiff brush the hair is roomed into the dish or onto a black tile and carefully observed or moving mites and lice. This is a simple and effective aid for harvest / Forage and Poultry mites and for lice (both *Damalinia* and *Haematopinus*) can be readily identified. A dissecting / stereo microscope is very useful but a magnifying glass and a black tile can be very useful. This also collects scale and crust and some hairs and so a lot of information is available from a simple cheap test.

![Image of skin brushing technique](image13.png)

*Figure 13:* This case illustrates the skin brushing technique for harvesting parasites from the surface of the skin. The advantage is that it harvests from a large area. A denture toothbrush is a very cheap and effective method. It is possible to examine the groomings with a magnifying glass alone and get enough diagnostic information. It also ‘harvests’ crust and scale for examination.

**c) Hair Plucking:**
Where dermatophytes or dermatophilosis is suspected there is usually some scaling or crusting and hair loss. Hairs should be plucked using a pair of haemostats from the fresh margins of young lesions. After plucking the hairs (which are placed in an unsealed (non-airtight) sterile bottle / universal) the area can be slightly cleaned with spirit and at least 4-5 samples are then taken from the margin and placed in sterile bottles.

![Image of hair plucking](image14.png)

*Figure 14:* Hair pluckings are useful for both direct microscopic examination and culture for some bacterial and fungal disorders. They can also provide information on the stage of hair growth although trichogram use is not widely reported in horses. The picture on the left shows a typical dermatophytosis lesion (*Microsporum equi*) and that on the right a typical Dermatophilosis lesion (Rain Scald) on the back of a horse. In the former case ectothrix spores and fungal mycelia was seen on direct microscopy and culture was positive. In the latter the plucking was simply used to make a smear, which showed the typical railway organisms when stained with Wright-Giemsa (Dif-Qik).

**d) Acetate tape preparations:** *(Sellotape)*
Used primarily to identify *Oxyuris* eggs on the peri-anal region. Four centimetre lengths of clear adhesive tape are stuck onto the skin around the anus and perineum. The tape is then removed and stuck onto a glass slide onto which a drop of mineral oil has been applied (this helps to disperse the bubbles and artefacts which can be confusing). It can then easily be examined under low power for the characteristic oval-triangular operculate eggs (90 μm x 30 μm).

**Figure 15:** The typical operculate eggs of *Oxyuris equi* harvested on an adhesive strip preparation from a horse with perinal pruritus.

e) Skin Biopsy:
The value of biopsy should not be overstated—many different conditions can induce an almost identical histopathologic effect. This makes it difficult or impossible for the pathologist to state a definite diagnosis. It is unreasonable to expect him to be able to help in every case! It is very helpful to provide the pathologist with as much helpful information as possible (possibly sending in a copy of your history and clinical findings sheet). Pathologists are very willing to help but do not take kindly to being challenged unnecessarily and then derided because they cannot make a diagnosis for you - you are in the same team not competitors on opposite sides of the field!

**Figure 16:** A punch biopsy being taken from a wide area of changed skin. Note that the needles used for injecting the tiny bleb of local anaesthetic are left in situ so that the exact site can be biopsied.

Skin biopsies are taken for the following reasons:

1. to establish a specific diagnosis
2. to eliminate defined clinical conditions
3. to monitor the course of disease
4. to confirm the completeness of surgical excision of tumours

A single biopsy will seldom answer all four of these questions. It is useful therefore to obtain multiple samples from defined types of lesions (the pathologist should be told the site and the nature of the lesions as far as possible). The exception to this is the vesicle which must be biopsied as early as possible - many are pruritic and so are subject to early self-inflicted damage which seriously alters the pathology and others rapidly become secondarily infected or altered after bursting - again affecting the diagnostic value.

- Biopsies of papules or pustules are prime examples of suitable lesions for
biopsy.

- Most neoplastic lesions provide definitive biopsies but can be complicated by concurrent infection or granulation tissue.
- Immune mediated disorders can be difficult to biopsy effectively. They may also require specialised immunohistochemistry to detect immune complexes.
- Ulcers and crusts are less definitive
- Chronic lesions, superficial inflammatory changes and lichenified crusted dermatoses gain little from biopsy.

Diseases for which Biopsy is useful:

⇒ Autoimmune diseases (pemphigus foliaceus and bullous pemphigoid - must be biopsied in unruptured state by SHAVE BIOPSY. Whole lesions should be removed if possible. Biopsy of crusts and ulcers can be useful in Pemphigus foliaceus as often primary vesicles are transient and not often visible. Samples are dispatched for histopathology and immunohistology. Check with lab before obtaining samples to ensure correct fixative.

⇒ Granuloma caused by bacteria, fungi, and other parasites. Sections can be stained specifically to identify the organism e.g. *Onchocerca*, deep mycosis, Demodex etc.

⇒ Neoplasms. These require suitable careful biopsy. If considered safe a wedge biopsy is best in which normal skin and tumour are included with the interface between them.

⇒ Parasitic Diseases are less suitable except for Habronema and *Onchocerca* infestations.

⇒ Infectious Diseases can be helped by biopsy - particularly if the sampled tissue is divided for culture and for histological examination. Staphylococcus and Dermatophilosis and Dermatophytosis may be easily identified from both modalities.

⇒ Specific Diseases including cutaneous amyloidosis, eosinophilic granuloma, nodular collagen necrosis and several others can provide specific diagnoses.

**Note:**

*Skin biopsy is not usually helpful when the skin changes are very chronic or when there has been self trauma or iatrogenic interference. For this reason the site of biopsy is not scrubbed or washed at all and if possible local anaesthetic should not be used immediately adjacent to the site.*

**Method:** Do not shave or scrub the area prior to biopsy – most biopsies are small and there may be a greater danger from misdiagnosis if the skin is scrubbed before biopsy. The patient may require sedation and local anaesthesia (this must be located so as not to influence the biopsy site). It is vital that the site is not infiltrated with local anaesthetic agents. Placement of local anaesthetic should be carefully considered to minimise the inflammatory effects that they create in the skin; often biopsy can be performed with regional nerve blocks or even without any local analgesia in a sedated and twitched horse. If local infiltration is used it is useful to leave the needle in situ so that a small amount can be used and the biopsy site can be accurately located. A scalpel blade or a biopsy punch should always be used - scissors cause severe crushing artefacts and squeezing with rat tooth forceps is also potentially harmful to the subsequent histological examination. The specimen must be treated very carefully so that maximal information can be obtained.

1. **Shave Biopsy:**
   The epidermis is shaved off in layers parallel to the surface of the skin. No sutures are required. The pathologist will need to know how the specimen has
been taken.

2. **Punch Biopsy:**
Sterile disposable skin punches (6 / 8/ 9 mm diameter) are available – whilst the smallest punches create the least damage they are also frequently the least useful! Very small specimens may not be diagnostic and may distort significantly making both the collection and the handling problematical. A 25g needle is used to remove the biopsy from the underlying fat – it should not be grasped with rat tooth or plain forceps. It is useful to obtain a normal biopsy from adjacent area if an interface between normal and abnormal tissue is not obtained. These wounds heal very rapidly and there is no need to suture them. **Wedge Biopsy:**
Used for larger lesions. A full thickness cut through abnormal tissues and normal skin including the interface is made. Careful selection of site is important. The site can be cleaned and sutured after biopsy, is taken.

3. **Excisional / Wedge Biopsy:**
Both abnormal and normal skin is required in one sample. Useful for vesicles, pustules. An elliptical incision is made to include all tissues down to panniculus muscle. The wound is cleaned and sutured after biopsy is taken.

**NOTE:**
It is suggested that surgical wedge and excisional biopsies are laid down on a small square of card for about 1 minute to allow them to adhere to it before placing in the fixative. This helps to prevent curling and distortion of the biopsy in fixative. Larger pieces of skin should be pinned to card in their natural state. Commercially available specimen meshes are helpful.

It is wise to consult with the pathologist if there is any doubt as to what the best specimen and fixative are for particular circumstances.

4. **Fine Needle aspirate (FNA):**
Fine needle aspirates can be useful in some cases. Simply aspirating the contents of a fluid filled skin mass may confirm the presence of pus in an abscess. Blood and serum/plasma may indicate a haematoma. A milky white fluid is characteristic of the dermal inclusion cysts known as an atheroma. Aspiration from a melanoma is instantly pathognomonic but whilst the cells are typical of the broad condition, they seldom provide enough pathological information. In spite of the useful application of FNA’s their value is very limited. This probably reflects the poor state of knowledge about many skin masses – in other species a definitive diagnosis can usually be achieved because much more interpretive experience is available.
Fine needle aspirates are possibly the most misused diagnostic test of all in dermatology. The correct technique is critical.

a) Use a small needle (23 g) and a small syringe (2 – 5 ml only). The concept that a ‘big needle and a big syringe will get better samples’ is absolutely not the case!

b) Sample from the edge of the lesion NOT the centre – the centre may be necrotic and have overt inflammation and those areas are not going to provide the best diagnostic cells!

c) Prepare the slides beforehand (marked on the frosted part in PENCIL with the name and case details).

d) Do not fix the slides unless you are told to by the pathologist – air dry them quickly and seal them into a slide carrier.

e) Do not try to interpret them yourself – they are difficult and it is easy to misinterpret cell morphology.

**Figure 18: Fine needle aspirate being taken from a solid mass in the eyelid region. This was diagnosed as sarcoid.**

**Fixatives:**
1. Formal saline (Buffered Neutral Formalin) - always use at least 10x volume of specimen.
2. Michel's Medium: used for immunofluorescence
3. Bouin’s Medium
4. Glutaraldehyde - for electron microscopy (1 mm cubes maximum)
   Pathologists are usually happy to receive samples properly collected in 10% formalin but it is sometimes useful to consult them first so that they can identify the right sample and the correct fixative.

**Precautions:**
- Do not overstretch samples during or after biopsy.
- Use scalpel NOT scissors
- Use needle to remove sample NOT forceps (if possible)
- Samples should be reduced to < 1 cm in size allow good fixer penetration. Large samples should be cut in serial section and m. Attempts to wash them after the biopsy has been taken often simply carry infection into the site and so they are best left alone to heal. placed in consecutively numbered containers.
- For electron microscopy (e.g. poxvirus etc.) place 1 mm cubes in glutaraldehyde.
- For bacteriology place specimen in transport medium or in ice for transport to lab.
- Multiple sections are useful from large specimens.
- Complete large specimens can be sent in formalin saline.
- Small specimens < 4 mm barely adequate - crushing and distortion are common

f) **Intradermal allergy Testing:**
Over many years there has been an increased interest in the use of intradermal testing for allergic conditions in small animals and humans. Opinions are strongly divided as to the value of these tests in equine diagnosis. Intradermal tests are usually performed by injecting small (threshold) doses of allergens into the skin on a pre-prepared area of the neck. The responses are compared to a saline negative control and a histamine positive control site. A recent discussion in the World Veterinary Dermatology Conference showed that the overall opinion was that whilst it can help in some cases the results are hard to interpret and that the panel of available allergens was possibly not the most appropriate for horses. Furthermore there was no correlation between the histological responses and the physical responses to the test even in animals known to be hypersensitive. An alternative patch testing procedure is used in some centres and the reports are possibly better.

The mechanism of the test is that the patient must be under no concurrent drug medication and that the material is injected intradermally at defined sites on a previously prepared (clipped and washed) area of the skin of the lateral neck. The responses are measured at 12, 24 and 48 hours post injection.

**g) IgE testing of blood:**
This carries similar problems to the skin tests. There is little repeatability on the tests with the same patient presenting different results from day to day. Again the tests are limited to around 125 – 150 rather arbitrary “substances and mixtures of substances”. The tests are simple to perform however, simply requiring a standard blood sample. This is then subjected to specific IgE ELISA to detect abnormal elevations of particular IgE proteins. The test has little or no value at present lacking specificity, sensitivity, repeatability and reliability. It is however likely that further development will lead to a more useful test.
Conclusions

Unusual presentations are frequently encountered in horses – for example there are many manifestations of the Pemphigus group of diseases and not all by any means will have a clear diagnostic pathway. It is important to remember that the skin is one of the biggest organs in the body and yet little is known of its function and pathology! Whilst there are many significant primary dermatological conditions there are also important systemic diseases that have more or less pathognomonic secondary dermatological signs; this makes the proper clinical examination even more imperative.

One of the biggest problems with equine dermatology is the dearth of scientific reports – many experienced clinicians have much useful information but this never reaches the rest of the profession. Also there are few useful equine dedicated reference text books. Probably equine dermatology suffers most of all disciplines in this respect. Every clinician is expected to re-invent the wheel! We have a need for publications and discussions about the problem cases – even the commonest skin diseases are poorly understood!

To make the most use of the supporting specialities of microbiology and pathology, it is important to involve the relevant specialists in the process. This means that they have to have as much information as they can get and it helps enormously if a photograph can be taken of the disease. Set against this help that they provide, there is a strong tendency for pathologists and microbiologists to make gratuitous statements about treatment options. For example a biopsy from an upper eyelid lesion might be easily diagnosed as a sarcoid and any statement concerning wide surgical excision might be both misleading and nonsensical.

The approach to the dermatological case requires a logical and exhaustive clinical investigation involving a thorough history and a detailed clinical examination. Diagnostic tests should be carefully selected to rule-out or confirm a suspected diagnosis. Frequent re-examinations are often required because it is sometimes difficult to establish the primary condition: this is often due to extensive self inflicted trauma or iatrogenic interference by the owner!

SUMMARY:

A logical and thorough clinical investigation should provide the best basis for the diagnosis of skin diseases. Where no diagnosis can be reached in spite of a full range of investigations, the clinician can justifiably attempt symptomatic treatment but otherwise it is far better to focus treatment on a specific condition. However, in equine dermatology there are few text descriptions of the majority of the conditions encountered in practice and whilst a few diseases are well recognised there is a still little consensus on the best treatments. There is no substitute for experience and reference to text books and colleagues who might have encountered the condition before.

Further Reading